

Introduction to Chronic kidney disease (CKD)

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Agenda

- What is Chronic Kidney Disease (CKD)?
- Staging of CKD.
- *CKD Is Common* (Epidemiology of CKD)
- *CKD Is Harmful*
- *CKD Is Treatable*
- Who to screen ?
- How to screen?
- Early detection of CKD

What is CKD?

KDIGO definition of chronic kidney disease

Structural or functional abnormalities of the kidneys for ≥ 3 months, as manifested by

1. *Kidney damage, with or without decreased GFR, as defined by*

- Markers of kidney damage

Urinary abnormalities (proteinuria)

Blood abnormalities (renal tubular syndromes)

- Structural abnormalities (e.g., on kidney imaging tests)
- Pathological abnormalities (e.g., renal biopsy)

2. *GFR < 60 ml/min/1.73 m², present for ≥ 3 months with or without kidney damage*

Stages of Chronic Kidney Disease

Stage	Description	GFR (mL/min/1.73 m ²)
1	Kidney Damage with Normal or ↑ GFR	≥ 90
2	Kidney Damage with Mild ↓ GFR	60-89
3	Moderate ↓ GFR	30-59
4	Severe ↓ GFR	15-29
5	Kidney Failure	<15 or Dialysis

- Classification of chronic kidney disease using GFR and ACR categories***

Kidney Function Stage	GFR (mL/min/1.73m ²)	Albuminuria Stage		
		Normal (urine ACR mg/mmol) Male: < 2.5 Female: < 3.5	Microalbuminuria (urine ACR mg/mmol) Male: 2.5-25 Female: 3.5-35	Macroalbuminuria (urine ACR mg/mmol) Male: > 25 Female: > 35
1	≥90	Not CKD unless haematuria, structural or pathological abnormalities present		
2	60-89			
3a	45-59			
3b	30-44			
4	15-29			
5	<15 or on dialysis			

Refer to colour-coded Clinical Action Plans for management strategies



To specify CKD fully

Combine

- ✓ Kidney Function Stage (stage 1-5) with
- ✓ Description of kidney damage (albuminuria)&
- ✓ Clinical diagnosis

(e.g., Stage 2 CKD with microalbuminuria, secondary to diabetic kidney disease).

CKD Is Common

Epidemiology of CKD

- CKD globally resulted in **735,000** deaths in 2010 up from 400,000 deaths in 1990.
- In Canada 1.9 to 2.3 million people have CKD.
- In the US, CKD affect **16.8%** of adults aged 20 years and older, during 1999 to 2004.
- UK estimates suggest that **8.8%** of the population of Great Britain and Northern Ireland have symptomatic CKD.

Incidence of CKD

- Less is known about incidence of CKD because few truly representative longitudinal cohorts are available for tracking and quantifying the development of new cases of CKD.
- According to one report based on the Atherosclerosis Risk in Communities (ARIC) study, the incidence rate was (10,350 per 1 million person-years) when incident CKD was defined as the MDRD equation's estimated GFR of less than 60 mL/min/1.73 m².

(Bash et al.,2009)

Prevalence of CKD

- studies as the National Health and Nutrition Examination Surveys (NHANES), showed an alarming increase in CKD prevalence during the last two decades in the United States.
- Other surveys in Europe and developing countries showed lower but variable prevalence.
- Discrepancies can be partially explained by differences in the prevalence of risk factors, such as diabetes, hypertension, obesity, and atherosclerosis.

- According to data from NHANES from 1999 to 2004, the prevalence rate of CKD stages 1 to 4 among people aged 20 or older was 131,000 per 1 million persons (13.1%). This translated into an absolute number of 26.3 million individuals

~ 27 Million Americans Have CKD

Stage of CKD	GFR (mL/min/1.73m ²)	n
1	$\geq 90^*$	3,600,000
2	60-89*	6,500,000
3	30-59*	15,500,000
4	15-29*	700,000
5	$< 15^*$	341,000*


*Prevalent dialysis patients.

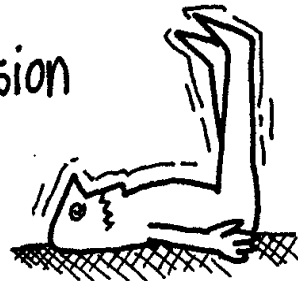
1. US Renal Data System. *USRDS 2007 Annual Data Report: Atlas of Chronic Kidney Disease and End-Stage Renal Disease in the United States*. 2007;
2. Coresh J, et al. *JAMA*. 2007;298:2038-2047; 3. Available at: <http://www.kidney.org/news/newsroom/newsprint.cfm?id=51>. Accessed April 18, 2008.

CKD Is Harmful

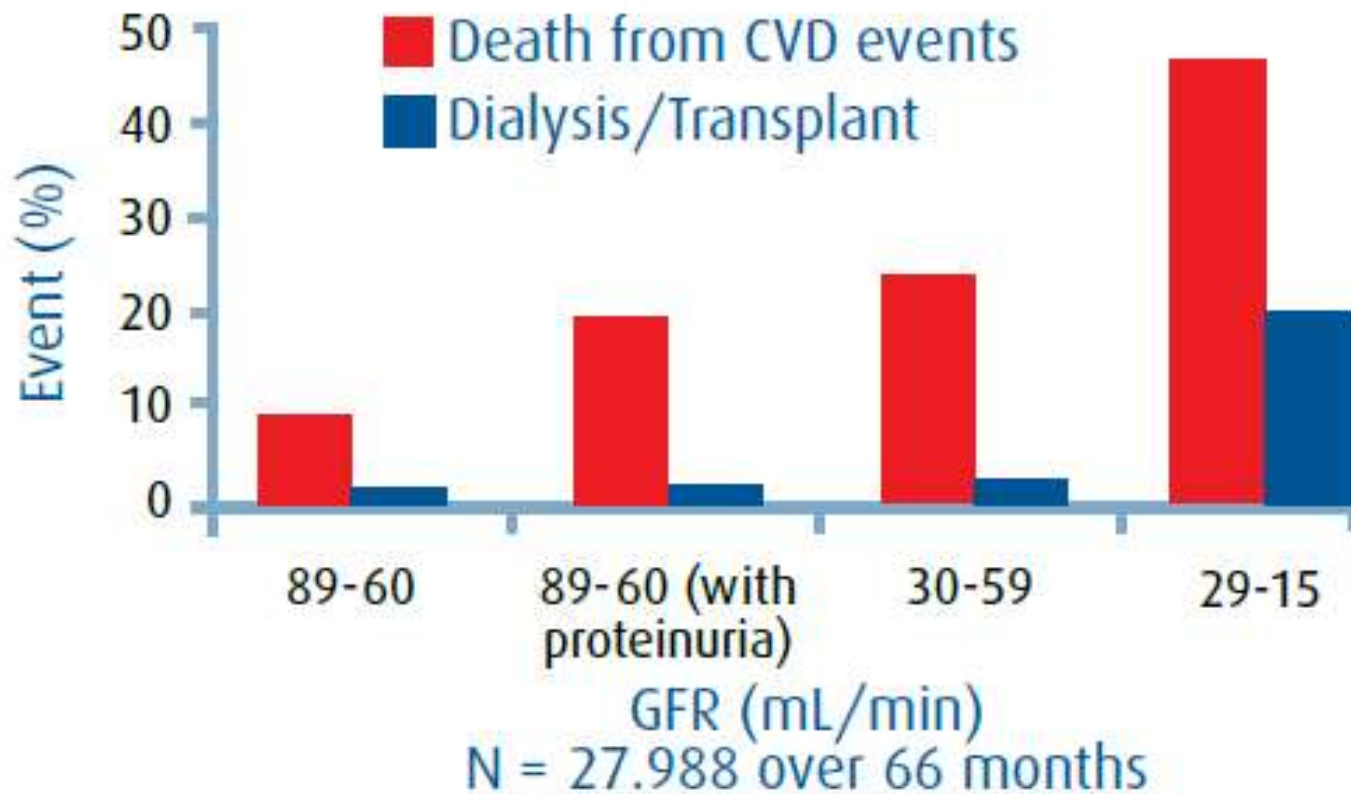
•Harmful

- costs: \$28 billion in 2010
- 400,000 on dialysis in USA
1.8 million worldwide
- increased mortality
5 year 35%, 20%/year,
- increased hospitalization
14 days/patient/year
- 10-20 fold increase in CVD

Thirst	Twitching	Fatigue
Confusion		Pallor
Coma		Nausea
Bone Pain		Vomiting
Pigmentation	Breathlessness	

	Convulsions	
Heart Failure		Peptic Ulcer
Hypertension		Cataracts
Colitis		Anemia
Osteomalacia	Neuropathy	

Outcomes in patients with CKD



Source: Keith et al. Arch Intern Med 2004;164:659-63.

Hypertension is both a cause of CKD and a complication of CKD and can be difficult to control.

The risks of uncontrolled hypertension include progression of kidney disease and increased risk of coronary heart disease and stroke.

Hypertension

Target: $\leq 140/90$ mmHg, or $\leq 130/80$ mmHg in people with albuminuria (urine ACR >3.5 mg/mmol in females and >2.5 mg/mmol in males)

CKD Is treatable

If CKD is detected early and managed appropriately, then the otherwise inevitable deterioration in kidney function can be **reduced** by as much as 50% and may even be **reversible**

- It is essential to regularly check for the known complications of CKD and to monitor treatment targets.

Who to screen ?

Potential risk factors for CKD

- **Adult are at increased risk of developing CKD if they are :**
 - 60 years or older
 - Diabetics
 - Hypertensive
 - Have a family history of kidney disease
 - Have established cardiovascular disease
 - Obese (body mass index ≥ 30)
 - Smoker

How to screen ?

- 2 simple tests will identify CKD in adults
- **eGFR** - Estimated GFR from serum creatinine using the MDRD equation.
- **UACR** - Urine albumin to creatinine ratio on a “spot” urine sample
 - 24-hour urine collections are NOT needed
- Screening should also include urine dipstick for proteinuria .

Two Study Equations Available for Estimating GFR in Adults

- ◆ MDRD study equation

$$\text{Estimated GFR (mL/min/1.73 m}^2\text{)} = 186 \times (\text{Cr})^{-1.154} \times (\text{age})^{-0.203} \times (0.742 \text{ if female}) \times (1.210 \text{ if African American})$$

- ◆ Cockcroft-Gault formula

$$\text{CrCl (mL/min)} = \frac{140 - \text{age}}{\text{SCr}} \times \frac{\text{weight (kg)}}{72} \times 0.85 \text{ if female}$$

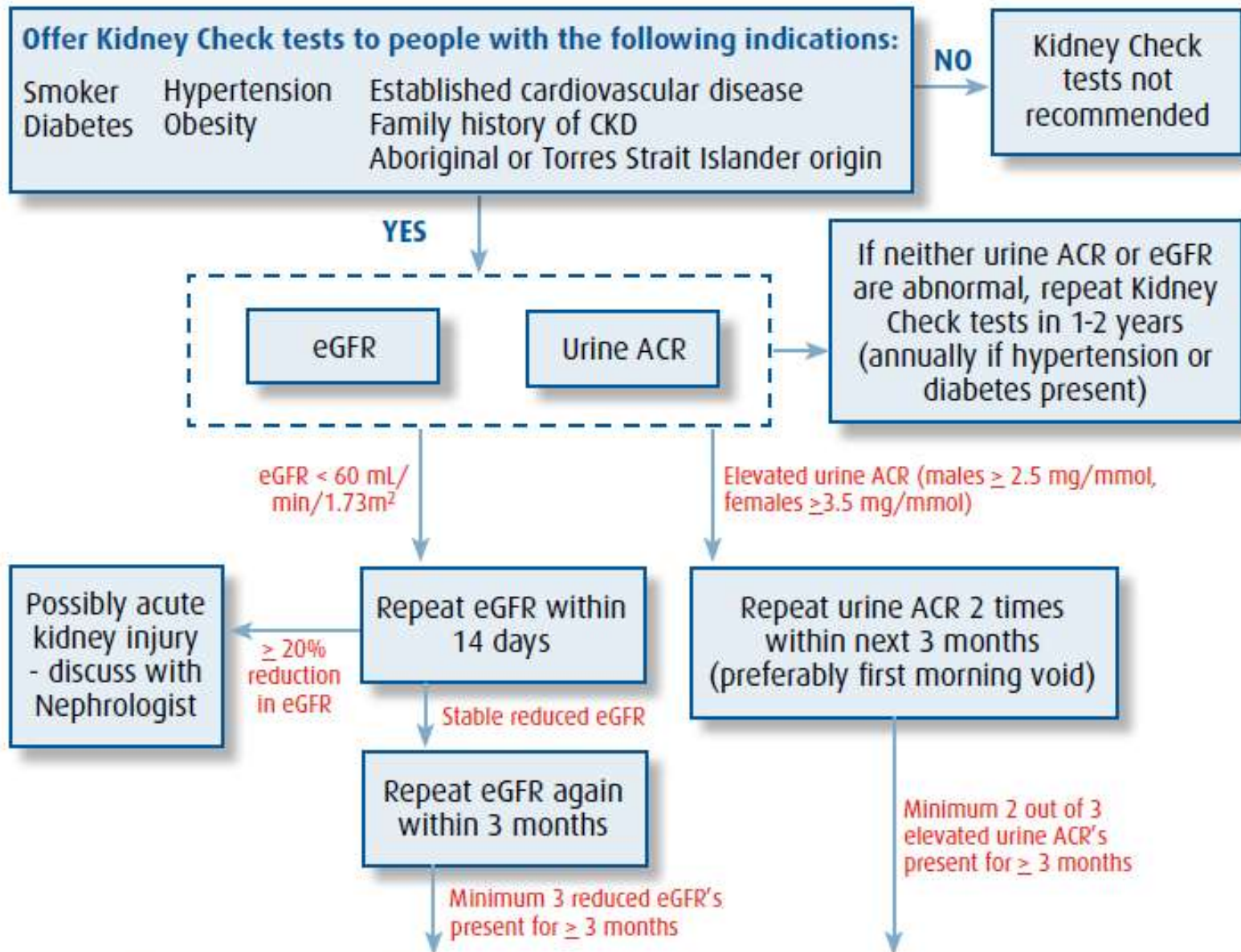
- ◆ GFR calculators are readily available

- <http://kidney.org>
- <http://nephron.com/cgi-bin/MDRD.cgi>

Levey et al. *Ann Intern Med*. 2003;139:137-147.

National Kidney Foundation. *Am J Kidney Dis*. 2002;39(suppl 1):S1-S266.

Algorithm for initial detection of CKD



CKD in Egypt

Burden of CKD in North Africa

There are no respective reports, or even rough estimates,

Earlier stages of CKD.

Several studies addressing this issue in Egypt, the largest screening programs are the 'EGIPT-CKD' (Egypt Information, Prevention and Treatment of CKD).

Renal Data from the Arab World

Egypt Information, Prevention, and Treatment of Chronic Kidney Disease (EGIPT-CKD) Programme: Prevalence and Risk Factors for Microalbuminuria among the Relatives of Patients with CKD in Egypt

Zaghloul Gouda¹, Ghada Mashaal¹, Aminu K. Bello², Adel El Attar¹, Talaat El Kemmry¹, Anwar El Reweny¹, Meguid El Nahas²

¹Department of Nephrology, Damanhour Medical National Institute, General Organization of Teaching Hospitals and Institutes, Ministry of Health, Egypt; ²Sheffield Kidney Institute, The University of Sheffield, Sheffield, UK

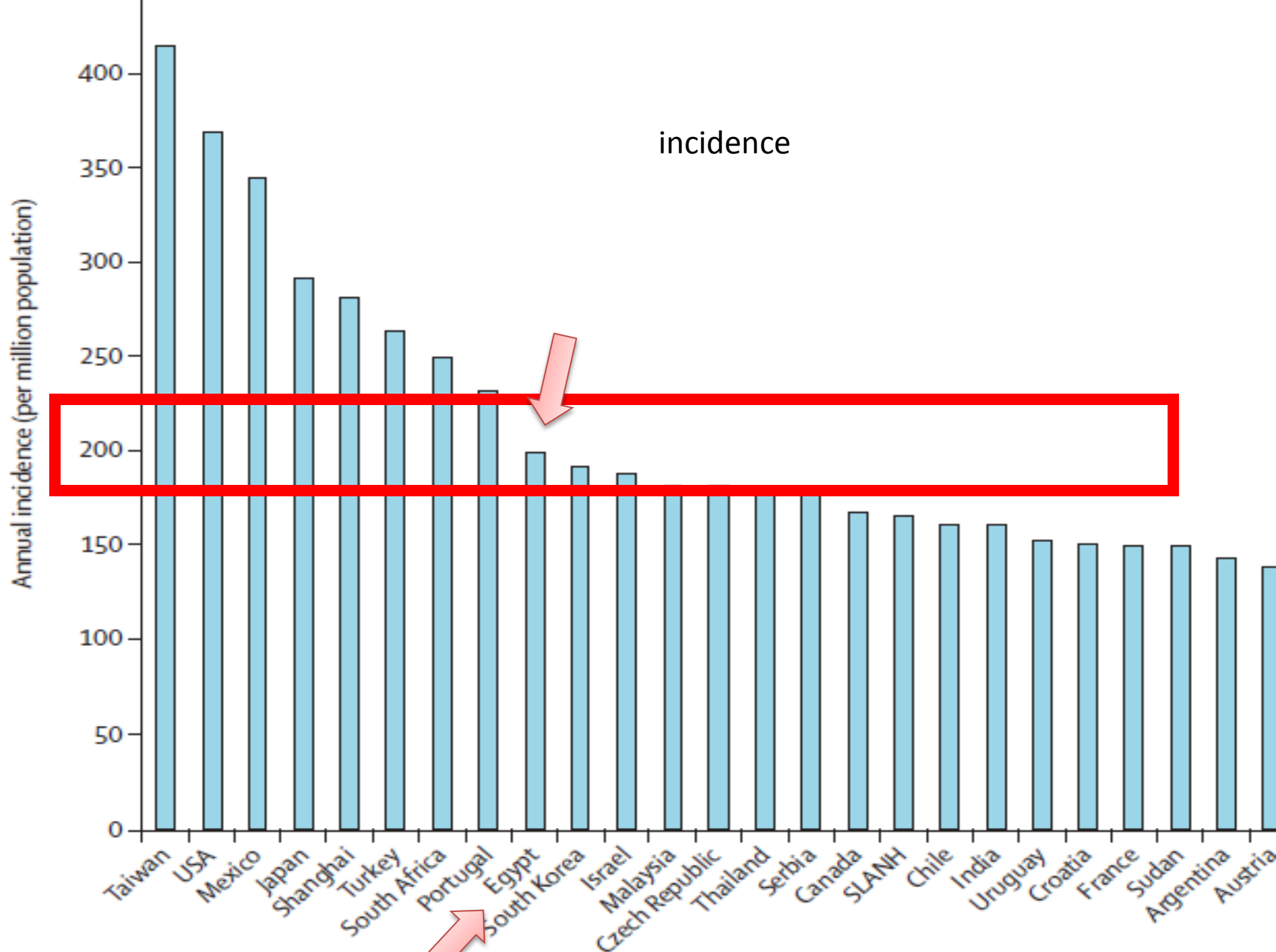
The reported frequency of end-stage kidney disease (CKD Stage V on dialysis).

	Egypt	Libya	Tunisia	Algeria	Morocco
Population (millions) ^a	83	7	11	35	32
GNI (US\$ as PPP) ^b	2070	12,020	3720	4420	2770
Incidence (pmp)	192	90	159	120	125
Prevalence (pmp)	650	323	734	475	300

Abbreviations: CKD, chronic kidney disease; GNI, gross national income; PPP, purchasing power parity.

^aMost recent census data.

^bWorld Bank data.



Global Kidney Diseases, Chronic kidney disease: global dimension and perspectives. 2013

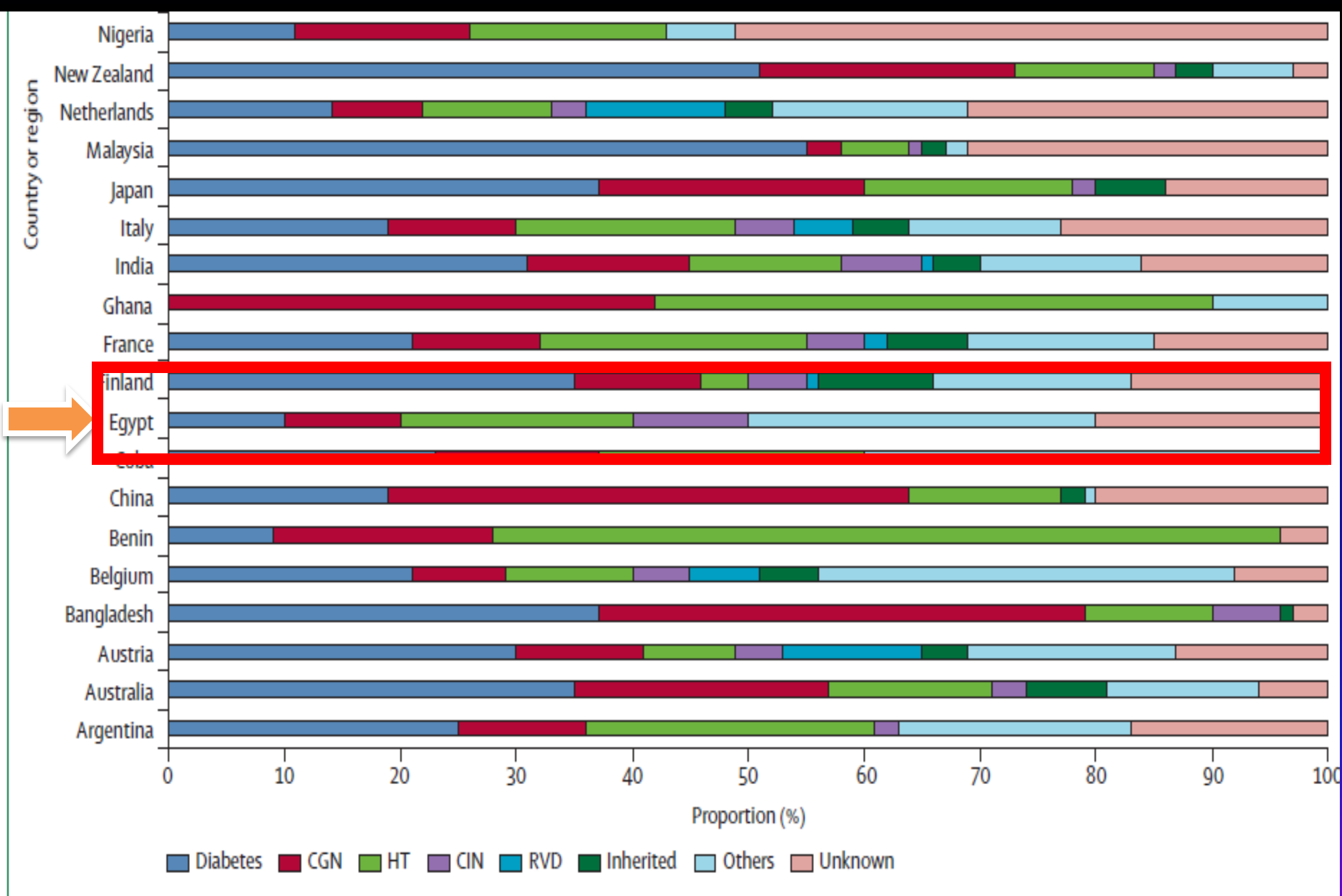
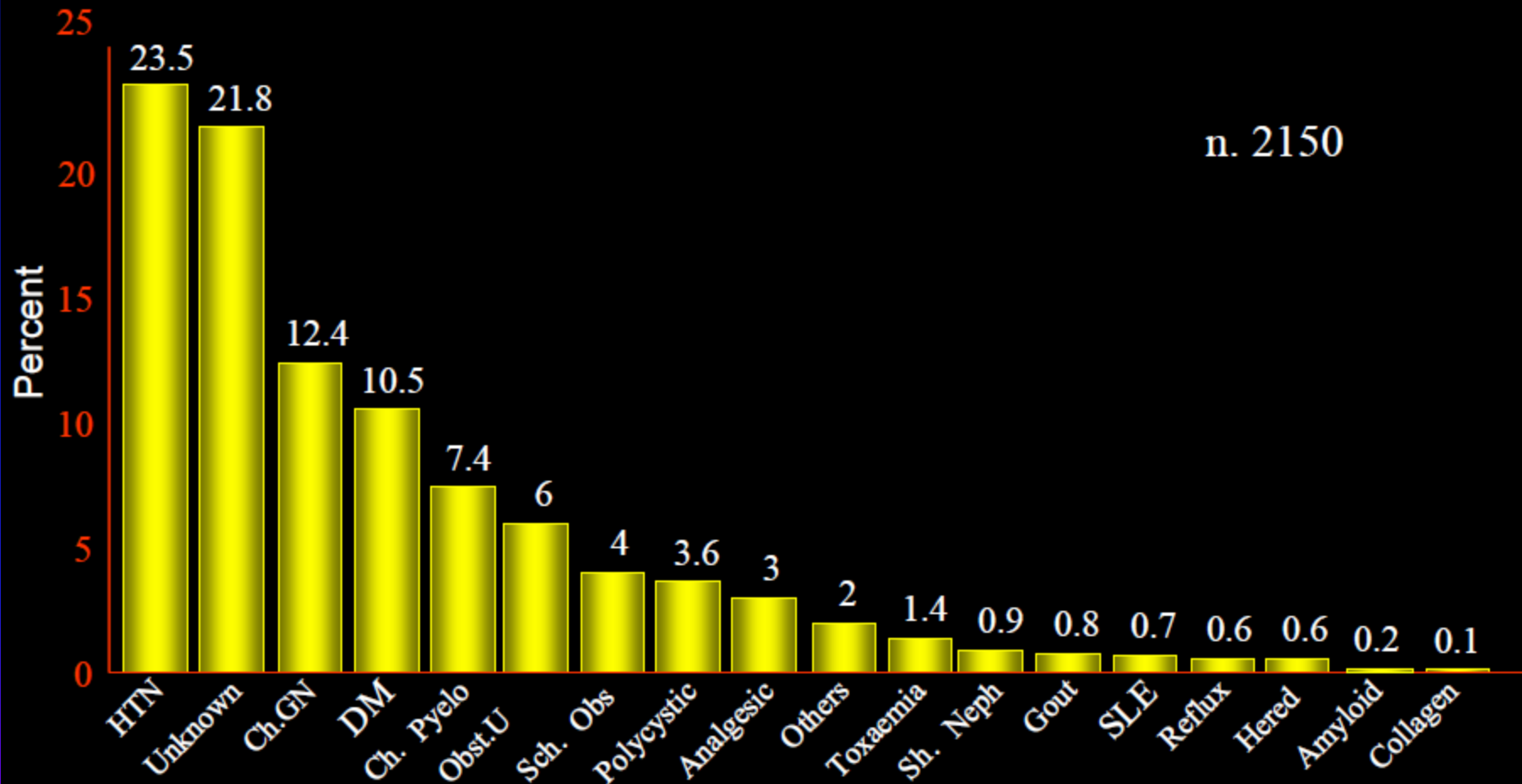


Figure 2: Distribution of causes of chronic kidney disease worldwide

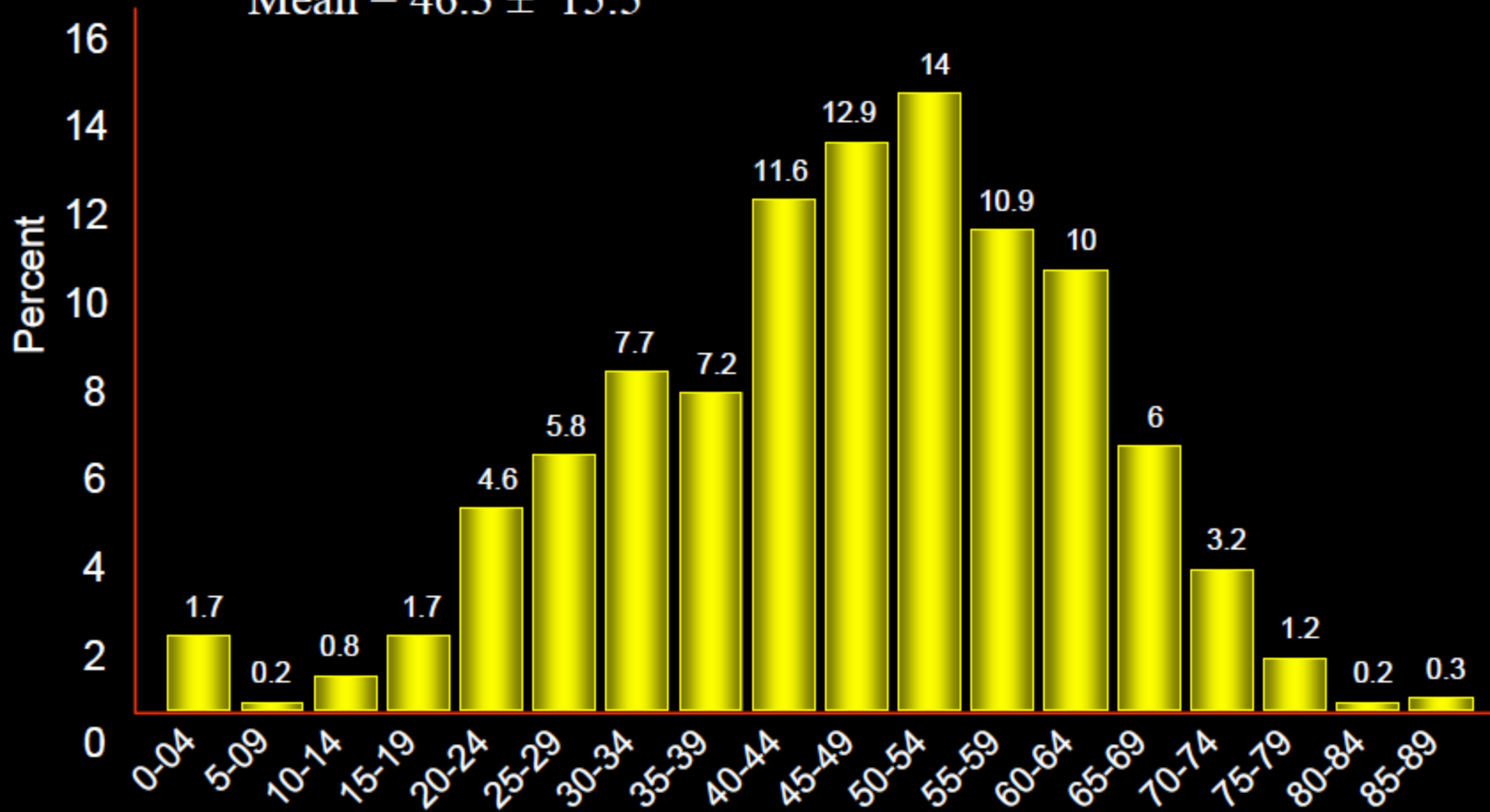
CGN=chronic glomerulonephritis. HT=hypertensive nephrosclerosis. CIN=chronic interstitial nephritis. RVD=renovascular disease.

Etiology of Renal Failure in Egypt 2000



Age Distribution of ESRD Patients

Mean = 46.3 ± 15.5



We need

Project

- Screening and Early Evaluation of Kidney Disease Project(SEEK)
prevalence and risk factors for CKD in Egypt.

Singh et al. *BMC Nephrology* 2013, **14**:114
<http://www.biomedcentral.com/1471-2369/14/114>



RESEARCH ARTICLE

Open Access

Epidemiology and risk factors of chronic kidney disease in India – results from the SEEK (Screening and Early Evaluation of Kidney Disease) study

Epidemiology of Chronic Kidney Disease in Egypt.

Start Date:01/01/2009

Project Type

Population-based Research (42)

Summary

In collaboration with Renal Division, Brigham and Women's Hospital, Harvard Medical School, Boston, MA and Mansoura and Menofeya Universities, Egypt, we established collaborative project aiming at screening and early evaluation of chronic kidney disease to represent the Egyptian component of the original project SEEK (Screening and Early Evaluation of chronic Kidney disease) designed originally by the global PI of the project Dr. Ajay Singh, Harvard Medicine. Dr. Farag is the PI in the Egyptian sites.

Locations

Cairo, Egypt (2)

Researchers

Mohamed Kamel Farag (2)

The role of microalbuminuria in population screening for chronic kidney disease in an Egyptian village

Rabie E. El Bahanasy^a, Omaina A. Mahrous^a, Mahmoud E. Abu Salem^a,
Manal A. El Batanony^a, Wesam S. Mourad^b and Zeinab A. Kasemy^a

- Objectives
- prevalence of and risk factors for (CKD) using microalbuminuria (MA) as a screening test in a rural area in Gharbia Governorate.

Chronic kidney disease of unknown origin

Unique causes and risk factors for chronic kidney disease, such as

- Environmental factors (Contamination of water, food, or both, by heavy metals, industrial chemicals, fertilisers, and pesticides).
- Exposure to herbal preparations. Herbal medicines

CONCLUSION

Facts About Chronic Kidney Disease (CKD)

- 27 million American adults have CKD and millions of others are at increased risk.
- Early detection can help prevent the progression of kidney disease to kidney failure.
- Heart disease is the major cause of death for all people with CKD.
- Glomerular filtration rate (GFR) is the best estimate of kidney function.
- Hypertension causes CKD and CKD causes hypertension.
- Persistent proteinuria (protein in the urine) means CKD is present.
- High risk groups include those with diabetes, hypertension and family history of kidney failure.
- Two simple tests can detect CKD: blood pressure, urine albumin and serum creatinine.

Thank
You!!

